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## (54) FLOW CONTROL VALVES

(71) We, MUCON ENGINEERING COMPANY LIMITED, a British Company, of Winchester Road, Basingstoke, Hampshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to flow control valves.

Particulate materials for domestic use, for example washing powders, are commonly sold in cardboard boxes or cartons and in quantities which involve dispensing the contents in stages so that the box or carton may stay in an opened condition for a considerable time after first use before it is emptied.

Commonly the box is opened by tearing a hole in one of the upper corners to allow the powder to be tipped out and after some of the powder has been dispensed there is generally no way of closing the box between subsequent occasions on which more powder is required, and degradation and contamination of the powder may result in consequence. If the box should be accidentally knocked over during its storage period a proportion of the contents may be spilled.

It is the object of the present invention to provide a valve which can be incorporated in the box structure so that during storage a preformed outlet orifice in a wall of a box can be closed during a storage period and re-opened when it is required to dispense the contents. Of necessity the valve is simple in structure and operation and inexpensive in production.

In accordance with the invention a flow control valve comprises a mounting plate having a circular aperture therethrough and mountable on the wall of a box or carton or other like container, a valve plate also having a circular aperture concentric with

the aperture of the mounting plate and rotatably mounted thereon, in superposed relationship thereto by a seating circumscribing the aperture of one of the plates to house the aperture edge of the other plate, and a flexible sleeve of tubular material turned back on itself to provide a double wall, the ends of the sleeve being attached to the valve plate and mounting plate respectively so that by relative rotation of the plates the sleeve can be twisted to form a closure diaphragm across the apertures, and wherein the sleeve is of elastic material and is attached to the plates in such manner that tension induced in the sleeve upon closure of the valve produces mutual pressure between inter-engaging surfaces of the plates to cause friction therebetween which resists relative rotation of the plates in the direction to allow the valve to open.

Preferably the sleeve is made of elastomeric material and its effective length is slightly less than its diameter. Preferably also the seating is formed by turning back the edge of the mounting plate aperture.

An exemplifying embodiment of the invention will now be described with reference to the accompanying drawings wherein:—

Figure 1 shows an elevation of a closure valve in accordance with the invention, suitable for attachment to a box or a carton.

Figure 2 shows a section of the elevation shown in Figure 1 on the line A-A.

Figure 3 shows a detail of the valve shown in Figures 1 and 2 on an enlarged scale, and

Figures 4 and 5 are views similar to Figure 3 of modifications.

In this embodiment a closure valve for a box or carton comprises a mounting plate 1 which is pierced by a circular aperture 2. The material of the plate forming the periphery of the aperture is turned back on itself to form an annular seating 3. A valve plate

4 also having a circular aperture 2 slightly greater in diameter than the mounting plate aperture lies in face-to-face contact with the mounting plate with the edge 5 of the aperture lying in the seating so that the two plates are relatively rotatable about the common axis of their apertures. The valve plate has a protruding part 6 extending radially away from its aperture forming a finger piece to facilitate rotation of the valve plate. A flexible tube 7 of elastic material is folded upon itself to form a double-walled sleeve, the inner and outer ends of the sleeve being attached to the mounting plate and the valve plate respectively around the edges of the plate apertures. For ease and cheapness of construction, both plates are made of a plastics material and the seating is a sufficiently tight fit on the valve plate aperture edge to produce a degree of "stiction" i.e. static friction, between the plates which prevent relative movement between them unless finger pressure is applied to the finger piece for this purpose.

In order to achieve a satisfactory degree of friction between the plates, it is necessary to provide pressure between them and to achieve this, use is made of the tension induced in the elastic sleeve 7 when the valve is closed or nearly closed.

The arrangement is shown most clearly in Figure 3. Tension induced in the sleeve shown by the arrows A causes pressure between the two plates as indicated by the arrows B causing a high degree of friction between the contacting areas of the plates. In addition, an annular area of the sleeve adjacent its connection to the plate 4 is pressed against the turned-back portion of the plate 1 which forms the seating 3 giving rise to pressure between the sleeve and the plate 1 as shown by the arrows C which produces additional frictional resistance to relative movement between the plates 1 upon opening the valve.

Within the scope of the invention the shape and arrangement of the plates can be varied widely to achieve the desirable levels of friction. In the form of the plates shown in Figure 4, for example, the seating 3 has a frusto-conical surface 8 which engages a mating surface 9 on the plate 4. In the form of the invention illustrated in Figure 5, the two plates are flat and are held in correct alignment by a ring 11 or a number of spaced lugs. The tension A in the sleeve in this example produces pressure between the plates as shown by the arrows D.

The valve is mounted on a box or carton wall 12 so that the surface of the mounting plate opposite to the Valve plate is in surface contact with the wall and the apertures are coaxial with and circumscribe a circular pouring orifice 13 cut in the wall. To close the valve, the valve plate is rotated

by the finger piece in either direction, thus twisting the sleeve progressively to form a tight diaphragm across the apertures. Since the sleeve is of elastic material a tight seal is obtainable, and the "stiction" between the plates prevents the valve reopening until required. The valve can be re-opened to any required extent by rotating the valve plate by means of the finger piece in the opposite direction to its closure movement.

It will, of course, be understood that the application of the invention is not restricted to cardboard boxes or cartons for powder material. It can be used in connection with a wide variety of containers of card, wood, metal or plastics construction employed to retain and dispense any flowable materials in the nature of powders or liquids.

Having regard to the provisions of Section 9 of the Patents Act, 1949, attention is directed to the Claims of Patent No. 908295.

#### WHAT WE CLAIM IS:—

1. A flow control valve comprising a mounting plate having a circular aperture through and mountable on the wall of a box, carton or other like container, a valve plate also having a circular aperture concentric with the aperture of the mounting plate and rotatably mounted thereon in superposed relation thereto by a seating circumscribing the aperture in one of the plates and housing the aperture edge of the other plate, and a flexible sleeve of tubular material turned back on itself to provide a double wall, the ends of the sleeve being attached to the valve plate and the mounting plate respectively so that by relative rotation of the plates the sleeve can be twisted to form a closure diaphragm across the apertures, and wherein the sleeve is of elastic material and is attached to the plates in such manner that tension induced in the sleeve upon closure of the valve produces mutual pressure between inter-engaging surfaces of the plates to cause friction therebetween which resists relative rotation of the plates in the direction to allow the valve to open.

2. A flow control valve according to claim 1 in which the edge of the aperture in the mounting plate carries the seating which receives the edge of the valve plate aperture and retains the two plates in their coaxial superposed relationship.

3. A flow control valve according to claim 2 in which the annular seating of the mounting plate is formed by turning back the edge of the mounting plate aperture, to form an annular groove which locates the edge of the valve plate aperture.

4. A flow control valve according to claim 2 or 3 wherein the plates are in closely fitting relationship to cause pressure therebetween which produces friction to

resist movement between the plates.

5 5. A flow control valve according to claim 2, 3 or 4 in which the tension induced in the sleeve produces pressure between a surface of the valve plate adjacent its aperture and a surface of the seating of the mounting plate.

10 6. A flow control valve according to any of the preceding claims wherein one of the sleeve ends is secured to a surface of the valve plate and lies in surface contact with the mounting plate adjacent its aperture whereby the tension induced in the sleeve causes mutual pressure between the sleeve adjacent its said end and the surface of the mounting plate so as to produce friction between the sleeve and the mounting plate which further resists relative rotation between the mounting plate and said end  
20 when relative rotation occurs between the plates to cause the valve to open.

7. A flow control valve according to any of the preceding claims wherein the sleeve is made of a rubber composition.

25 8. A flow control valve according to any of the preceding claims wherein the effective length of the sleeve is less than its diameter, in the unstretched condition.

9. A flow control valve according to any

of the preceding claims wherein the mounting plate and valve plate are both made of a plastics material.

10. A flow control valve according to any of the preceding claims wherein the valve plate has a protruding part extending radially away from its aperture forming a finger piece to facilitate rotation thereof.

11. A flow control valve constructed and arranged substantially as hereinbefore described and shown in Figures 1-3 or with reference to Figure 4 or 5 of the accompanying drawings.

12. A box or carton having a wall pierced with a circular pouring orifice and a flow control valve according to any of the preceding claims attached to said wall by the mounting plate such that the apertures in the valve plates are coaxial with a circumscribing pouring orifice in the box or carton wall.

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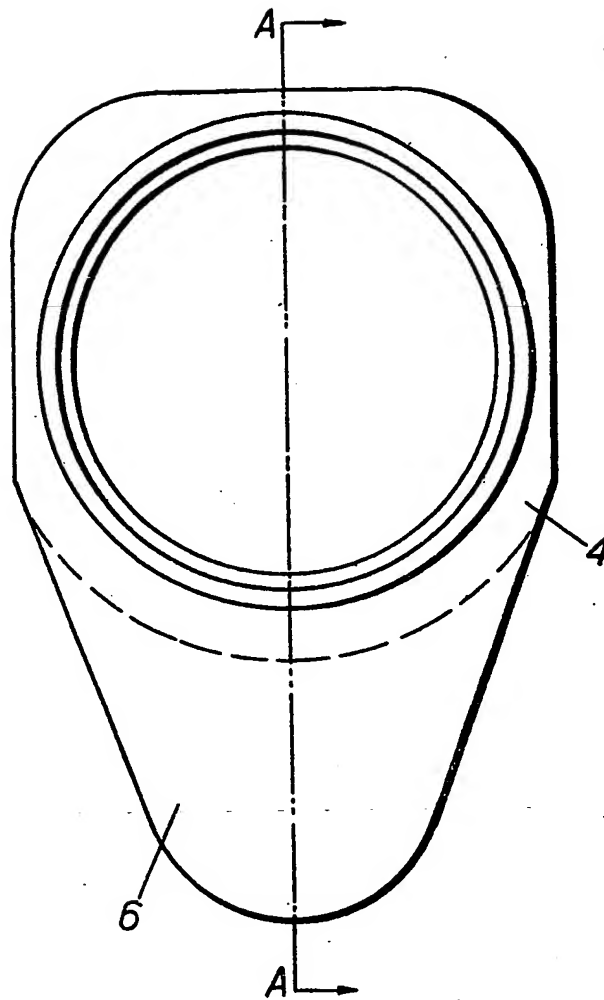


FIG. 1.

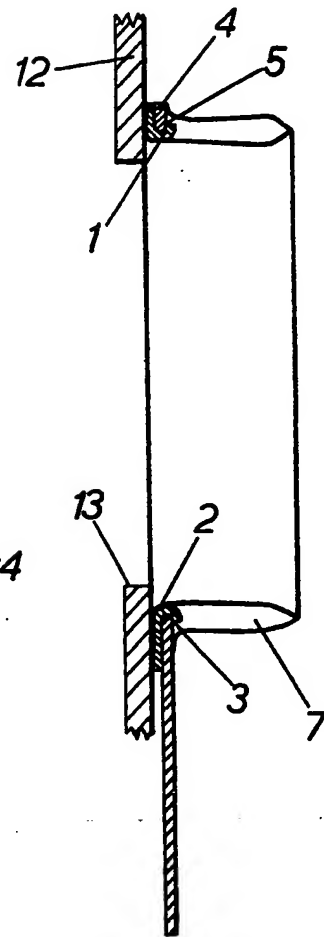


FIG. 2.

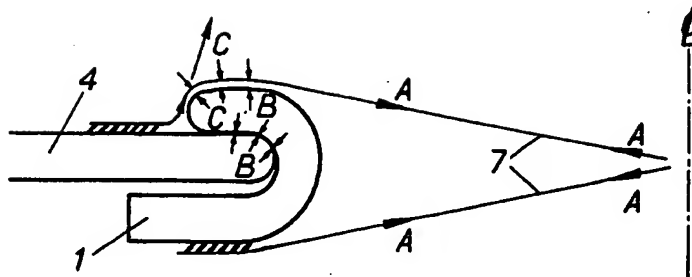


FIG. 3.

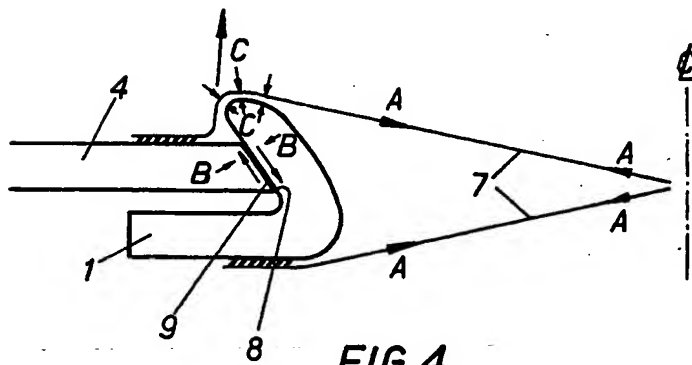


FIG. 4.

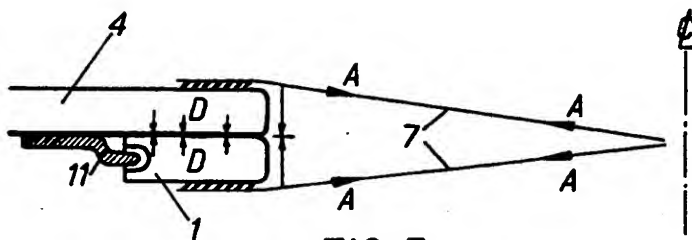


FIG. 5.